

Application No. 09/715,935

REMARKS

Claims 18-54 and 56-61 are pending. By this Amendment, claim 18 is amended for clarity. In particular, claim 18 has been amended to clarify that the reactant flow passes through the radiation beam. This is clearly implied in the unamended claim, but has been made explicit. As such, Applicants do not intend to narrow the claim by this amendment. The amendment is clearly supported by the specification, for example, at page 14, lines 15-17, where it is stated that "As the reactant stream leaves the light beam, the product particles are rapidly quenched." The description of entering and leaving the radiation beam directly described passing through the radiation beam, as presently claimed. No new matter is introduced.

All of the present claims stand rejected. Applicants respectfully request reconsideration of the rejections based on the following remarks. While Applicants do not acquiesce in the Examiner's assertions with respect to un-discussed features of dependent claims, Applicants do not consider these issues further here since they are moot in view of the comments below with respect to the independent claims.

Rejections Over Akedo et al., Bi et al. and Rao et al.

The Examiner rejected claims 18-29, 33-42, 44, 46-51, 55-57 and 59-61 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,280,802 to Akedo et al. (the Akedo patent), in view of U. S. Patent 5,958,348 to Bi et al. (the Bi patent) and U.S. Patent 5,874,134 to Rao et al. (the Rao patent). The Examiner cited the Rao patent for disclosing the motivation for combining the coating apparatus of the Akedo patent and the particle production apparatus of the Bi patent. Applicants maintain that the combined teachings of the references fall far short of teaching or suggesting the claimed invention and certainly for not render the invention prima facie obvious. The Examiner's rejection can only be based on hindsight reasoning based on Applicants' own invention as a template to reconstruct the invention from the prior art.

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Applicants respectfully request reconsideration of the rejection based on the following comments. For efficiency, Applicants incorporate by reference arguments from the Amendment of September 3, 2003 and the Appeal Brief of November 19, 2002.

The Federal Circuit has provided considerable guidance on establishing obviousness of a claim based on a combination of references. "Our case law makes clear that the best defense against hindsight-based obviousness analysis is the rigorous application of the requirement of a teaching or motivation to combine the prior art references." *Ecolchem Inc. v. Southern Edison*, 56 USPQ2d 1065, 1073 (Fed. Cir. 2000). "Therefore, '[w]hen determining the patentability of a claimed invention which combines two known elements, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *Id.* (quoting *In re Beattie*, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992)(quoting *Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co.*, 221 USPQ 481, 488 (Fed. Cir. 1984))). "In order to prevent a hindsight-based obviousness analysis, we have clearly established that the relevant inquiry for determining the scope and content of the prior art is whether there is a reason, suggestion, or motivation in the prior art or elsewhere that would have led one of ordinary skill in the art to combine the references." *Ruiz v. A.B. Chance Co.*, 57 USPQ2d 1161, 1167 (Fed. Cir. 2000). "The test is not whether one device can be an appropriate substitute for another." *Id.* (emphasis added). In *Ruiz*, the Federal Circuit overturned a district court holding that "it would have been obvious to combine screw anchors and metal brackets, because the need for a bracket 'was apparent.'" *Id.*

The deficiencies of the combination of the Bi patent and the Akedo patent are clear and have been presented in great detail in the Appeal Brief of November 19, 2002. The Examiner cites the Rao reference to provide the motivation to combine the Bi particle production apparatus with the coating apparatus of the Akedo patent. However, a lack of motivation for the combination is far from being the only deficiency of the combination, and the Rao patent does

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not even succeed in providing the motivation. As stated in the Appeal Brief, "even assuming that the references are properly combinable, the specific combination from the teachings of the references that is suggested by the Examiner yields an inoperable or internally incompatible system." The Examiner seems to assert without explanation that these two complex apparatuses can simply be joined together without any further consideration. Problems with this idea have been previously discussed in the Appeal Brief and elsewhere without rebuttal by the Examiner. There simply is no reasonable expectation of success with respect to the combination.

With respect to motivation, the Bi patent and the Akedo patent simply do not motivate their combination. The Rao patent was cited to provide such a motivation. The Rao patent discloses a deposition approach that can be based on a high temperature energy source 14, as shown in Fig. 1. As noted at column 4, lines 23-27, the high temperature energy source can be a high energy laser. While the Rao patent mentions such a possibility, a person of ordinary skill in the art would take this with a grain of salt. If a high energy laser were used as energy source 14 it would destroy the very surface that was intended for coating since the laser would be aimed right at the surface. The Examiner is simply pointing to very complex apparatuses and reconstructing them using Applicants' invention as a template without any teaching in the references on how to do this. This is the epitome of impermissible hindsight reconstruction.

In the Examiner's comment in the Office Action of December 3, 2003, the Examiner remarked that "It is within the level of ordinary skill to operate a process continuously." As mandated by the Supreme Court, an obviousness analysis is extremely fact driven. See MPEP 2141. General principles can be useful as described in MPEP 2144.04. But these are not a substitute for a full factual analysis. Applicants' invention is not simply making the Akedo process continuous. Making the Akedo process continuous is arguably putting a continuous particle feed for the particle reservoir of the Akedo apparatus and not designing a

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particle production apparatus to go with their apparatus. The Examiner's remarks miss the point by a long shot.

With respect to claims 33-38 and 46-51, the Examiner is under the misimpression that Applicants argued against the references individually. This is simply not true. As stated in the Amendment of September 3, 2003, "Since the combination does not seem functional, the combined disclosures of the Akedo patent, the Bi patent and the Rao patent do not render Applicants' claims prima facie obvious." How can this be interpreted as an argument against the references individually?

A basis principle of an obviousness analysis is that the reference must be looked at as a whole. See MPEP 2141.02. In viewing the combined teachings of the Bi patent, the Akedo patent and the Rao patent, one sees three distinct complex apparatuses that operate on different principles. None of them point in any way to the claimed invention. Based on hindsight, this invention, like almost every invention ever made, is arguably obvious. However, absent hindsight, the cited references simply do not lead a person of ordinary skill in the art to Applicants' claimed invention in any way at all. Similarly, there is no clue how to combine these disparate and complicated structures with any, even an unreasonable, expectation of success. The Examiner has fallen far short of presenting a case of prima facie obviousness.

Applicants respectfully request withdrawal of the rejection of claims 18-29, 33-42, 44, 46-51, 55-57 and 59-61 under 35 U.S.C. § 103(a) as being unpatentable over the Akedo patent, in view of the Bi patent and the Rao patent.

Rejection Over Lehman, Akedo et al., Bi et al., Rao et al. and Kambe et al.

The Examiner rejected claims 30, 43, 45, 52 and 58 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,097,144 to Lehman (the Lehman patent) in view of the Akedo patent, the Bi patent and the Rao patent, further in view of the Kambe application. The

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Examiner cited the Lehman patent for its disclosure relating to glass coatings. The deficiencies of the combined disclosures of the Akedo patent, the Bi patent and the Rao patent with respect to Applicants' claimed invention were described in detail above. Applicants maintain that the combined disclosures of the references do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejection based on the following comments. For efficiency, Applicants incorporate by reference arguments from the Amendment of September 3, 2003 and the Appeal Brief of November 19, 2002.

The Lehman patent is cited for teaching glass coatings, and the Kambe application is cited for teaching that laser pyrolysis is capable of producing glass materials. The Kambe application teaches a similar apparatus and process as disclosed in the Bi patent, which has overlapping inventors with the Bi patent. Thus, the Kambe patent does not add any further teaching toward the presently claimed invention beyond the teachings of the Bi patent. The Lehman patent does not teach or suggest particle production or particle deposition. Thus, the Lehman patent clearly does not make up for the deficiencies of the Akedo patent, the Bi patent and the Rao patent with respect to Applicants' claimed invention. Since the Kambe application and the Lehman patent do not make up for the deficiencies of the Akedo patent, the Bi patent and the Rao patent with respect to Applicants' claimed invention, the combined disclosures of the Lehman patent, the Akedo patent, the Bi patent, the Rao patent and the Kambe application does not render Applicants' claimed invention prima facie obvious.

Applicants respectfully request withdrawal of the rejection of claims 30, 43, 45, 52 and 58 under 35 U.S.C. § 103(a) as being unpatentable over the Lehman patent in view of the Akedo patent, the Bi patent and the Rao patent, further in view of the Kambe application.

Rejections Over Akedo et al., Kambe et al., and Rao et al.

The Examiner rejected claims 18-29, 33-52 and 55-61 under 35 U.S.C. §103(a) as being unpatentable over the Akedo patent in view of the Kambe application and the Rao patent.

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All the relevant independent claims of this rejection were discussed above in the context of the rejection over the Akedo patent, the Bi patent and the Rao patent. The apparatus and methodology in the Kambe application are comparable to the corresponding apparatus and methodology in the Bi patent. Therefore, the arguments above relating to the Akedo patent, the Bi patent and the Rao patent apply equally to the combined disclosures of the Akedo patent, the Kambe application and the Rao patent. Since the combined disclosures of the Akedo patent, the Bi patent and the Rao patent do not render Applicants' claimed invention prima facie obvious, the combined disclosures of the Akedo patent, the Kambe application and the Rao patent do not render Applicants' claimed invention prima facie obvious for the reasons discussed in detail above. Applicants respectfully request withdrawal of the rejection of claims 18-29, 33-52 and 55-61 under 35 U.S.C. §103(a) as being unpatentable over the Akedo patent in view of the Kambe application and the Rao patent.

Rejection Over Lehman, Akedo et al., Kambe et al. and Rao et al.

The Examiner rejected claim 30 under 35 U.S.C. §103(a) as being unpatentable over the Lehman patent in view of the Akedo patent, the Kambe application and the Rao patent. Claim 30 depends from claim 18. The Lehman patent does not teach or suggest particle formation or particle deposition. Therefore, the Lehman patent does not make up for the deficiencies of the combined disclosures of the Akedo patent, the Kambe application and the Rao patent with respect to claim 18 and correspondingly claim 30. Since the combined disclosures of the cited references do not render claim 30 prima facie obvious, Applicants respectfully request withdrawal of the rejection of claim 30 under 35 U.S.C. §103(a) as being unpatentable over the Lehman patent in view of the Akedo patent, the Kambe application and the Rao patent.

Rejection Over Tran et al., Lehman, Akedo et al., Bi et al., Rao et al. and Kambe et al.

The Examiner rejected claims 31 and 32 under 35 U.S.C. §103(a) as being unpatentable over U.S. patent 6,074,888 to Tran et al. (the Tran patent) in view of the Lehman

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patent and further in view of the Akedo patent, the Bi patent and the Rao patent, in view of the Kambe application. The Examiner cited the Tran patent for disclosing optical components. Claims 31 and 32 depend from claim 18. Above, it was noted that the combined disclosures of the Akedo patent, the Bi patent and the Rao patent do not render claim 18 prima facie obvious. Furthermore, it was noted that the Kambe application and the Lehman patent do not make up for the deficiencies of the Akedo patent, the Bi patent and the Rao patent with respect to teaching the subject matter of claim 18. The Tran patent refers to "known epitaxy techniques" for depositing optical materials. See, for example, column 3, lines 24-27. The Tran patent does not teach deposition approaches that make up for the deficiencies of combining the teachings of the Akedo patent, the Bi patent and the Rao patent to obtain Applicants' claimed invention. Thus, the combined disclosures of the Tran patent, the Lehman patent, the Akedo patent, the Bi patent, the Rao patent and the Kambe application do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 31 and 32 under 35 U.S.C. §103(a) as being unpatentable over the Tran patent in view of the Lehman patent and further in view of the Akedo patent, the Bi patent and the Rao patent, in view of the Kambe application.

Rejection Over Tran et al., Lehman, Akedo et al., Kambe et al., Rao et al.

The Examiner rejected claims 31 and 32 under 35 U.S.C. §103(a) as being unpatentable over the Tran patent in view of the Lehman patent and further in view of the Akedo patent, the Kambe application and the Rao patent. As noted above, the combined disclosures of the Tran patent, the Lehman patent, the Akedo patent, the Bi patent, the Rao patent and the Kambe application do not render claims 31 and 32 prima facie obvious. For the same reasons, the combined disclosures of the Tran patent, the Lehman patent, the Akedo patent, the Kambe application and the Rao patent do not render claims 31 and 32 prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 31 and 32 under 35 U.S.C. §103(a) as

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being unpatentable over the Tran patent in view of the Lehman patent and further in view of the Akedo patent, the Kambe application and the Rao patent.

Rejection Over Börner et al., Bi et al. and Rao et al.

The Examiner rejected claims 18-29, 33-42, 47-51, 53-57 and 59-61 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,032,871 to Börner et al. (the Börner patent) in view of the Bi patent and the Rao patent. Issues relating to the Börner patent in view of the Bi patent have been discussed in detail prior to the issuance of the present Office Action. The Examiner cited the Rao patent for disclosing the motivation for combining the Börner patent and the Bi patent along with the teaching of how to combine the disclosures of the Börner patent and the Bi patent. However, the Rao patent confuses rather than clarifies the combination of the disclosures in the Börner patent and the Bi patent. Thus, the combined disclosures do not render Applicants' invention prima facie obvious. Applicants respectfully request reconsideration of the rejection based on the following comments. For efficiency, Applicants incorporate by reference arguments from the Amendment of September 3, 2003 and the Appeal Brief of November 19, 2002.

The rejections based on the Börner patent are so clearly based on hindsight, it is difficult to know where to begin. Effectively, the Börner patent is non-analogous art to the particle production technology of the Bi patent. The disclosure of the Börner patent is very schematic since the patent is simply directed to adjusting the charges of sprays to prevent repulsion of different coating materials. The Börner patent relies on skill in the spray gun art to fill in huge amounts of undisclosed subject matter needed to enable the practice of the process in the Börner patent. On the other hand, the Bi patent discloses a complex apparatus for performing sophisticated production of highly uniform nanoparticles. Persons working in the respect fields would not look to the other field for insights in their own art. The technology in the Bi patent required precise alignment of a sophisticated laser with a flowing reactant stream. Complex flow



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patterns are taken into account. In the spray gun technology, one is simply try to get a coating material from a pot onto a surface. To assert that these technologies can be simply combined requires a great leap of hindsight.

But perhaps this rejection points to an underlying issue with the Examiner. The Examiner seems to be bothered by the fact that the collection of particles described in the Bi patent is in some sense a coating process, although admitted distinguished from the claimed coating process. Therefore, at first glance it may seem that the invention is not a great leap that requires an inventive step, to borrow from the European standard for patentability. On the contrary, the present invention represents great inventive leap.

The function of the Bi process requires a carefully aligned light beam, generally a laser beam, to intersect a reactant flow. Interfering with the flow down stream can alter the flow near the reaction zone and interfere with the entire process. The present inventors faced these issues to overcome to arrive at a functioning process that is presently claimed. Several ways are described in the application to handle the flow issues. Further improvements in this technology are the subject of follow on applications. This technology has been capable of providing extremely high quality coatings at greatly improved deposition rates compare with CVD and similar alternative approaches.

The laser pyrolysis references, such as the Bi patent and the Kambe application, are sophisticated approaches for the collection of particles. However, they do not directly lead a person of ordinary skill in the art to the present invention, and the other cited references simply do not provide the teaching, suggestion or motivation in combination with the Bi patent or the Kambe application to produce the presently claimed invention. The Examiner seems content to reassemble the present invention by pointing to particular references that show that particles have been used to form coatings. But there is a huge inventive leap to determine that the laser pyrolysis process can be adapted directly to a coating process. The Examiner has failed to point

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to any suggestion, teaching or motivation, not based on improper hindsight, that would lead a person of ordinary skill in the art in such a direction.

The Examiner has fallen far short of establishing prima facie obviousness. Applicants respectfully request withdrawal of the rejection of claims 18-29, 33-42, 47-51, 53-57 and 59-61 under 35 U.S.C. §103(a) as being unpatentable over the Börner patent in view of the Bi patent and the Rao patent.

Rejection Over Börner et al., Akedo et al. Bi et al. and Rao et al.

The Examiner rejected claims 42-54 under 35 U.S.C. §103(a) as being unpatentable over the Börner patent, in view of the Akedo patent, the Bi patent and the Rao patent. The Examiner cites the Börner patent for teaching two differently charged particle streams. The Examiner asserts that the Börner patent motivates the combination of two "Akedo and Bi" apparatuses to provide each stream. However, as discussed in detail above and in the Appeal Brief of November 19, 2002, the cited references do not teach an "Akedo and Bi" apparatus and the Rao patent teaches nothing to lead to an "Akedo and Bi" apparatus. Since the combined disclosures of the cited references do not lead to an "Akedo and Bi" apparatus, they certainly do not lead to two such apparatuses. Thus, the combined teachings of the Börner patent, the Akedo patent, the Bi patent and the Rao patent do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 42-54 under 35 U.S.C. §103(a) as being unpatentable over the Börner patent, in view of the Akedo patent, the Bi patent and the Rao patent.

Rejection Over Rao et al. and Bernecki et al.

The Examiner rejected claims 18-20, 23, 25, 27-29, 39-41, 56 and 58-61 under 35 U.S.C. §103(a) as being unpatentable over the Rao patent in view of U.S. Patent 5,744,777 to Bernecki et al. (the Bernecki patent). The Examiner asserts that the Rao patent teaches

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Applicants' claimed methods except for teaching a moving substrate. The Examiner cited the Bernecki patent disclosing coating a larger substrate by moving a plasma spray relative to the substrate. However, the cited references do not teach or suggest all of the features of Applicants' claimed inventions. Thus, the cited references do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the following comments.

This is the only pending rejection that is not based on some of the present inventors' earlier work on laser pyrolysis. Applicants previously presented arguments against this rejection in the Amendment of September 3, 2003. The arguments relating to this rejection from the Amendment of September 3, 2003 are incorporated herein by reference.

Claims 18-20, 23, 25 and 27-29

With respect to Applicants' arguments that the Rao patent teaches directing the radiation beam along the reactant flow, the Examiner indicated that claim 18 does not "contain a limitation that limits the radiation beam being at an angle to the flow." Applicants have clarified the scope of claim 18. The Examiner seems to acknowledge differences between Applicants' claimed invention and the teachings of the Rao patent. If the Examiner does not like Applicants' particular wording with respect to these differences, Applicants' representative would be happy to discuss the particular claim wording.

Claims 39-41 and 56-61

The Rao patent teaches a deposition rate less than 5 grams per hour. In particular, a deposition rate of 60 microns per minute over a 2 centimeter diameter substrate corresponds with about 1.2 cubic centimeters in an hour. Even if the silicon is fully compacted for a density of 2.33 grams per cubic centimeter, this corresponds only to 2.8 grams per hour. The Rao patent does not teach how to obtain the claimed the deposition rate. The Bernecki patent teaches away from the invention of claim 39 since the Bernecki patent teaches moving the substrate while

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claim 39 is directed to simultaneously depositing particles over the entire substrate surface. Furthermore, the Bernecki patent does not describe particle production or deposition rates. Thus, the Bernecki patent does not make up for the deficiencies of the Rao patent with respect to claims 56-61. Therefore, the combined disclosures of the Rao patent and the Bernecki do not render claims 39-41 or 56-61 prima facie obvious.

In summary, the combined disclosures of the Rao patent and the Bernecki patent do not render Applicants' invention prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 18-20, 23, 25, 27-29, 39-41, 56 and 58-61 under 35 U.S.C. §103(a) as being unpatentable over the Rao patent in view of the Bernecki patent.

#### CONCLUSIONS

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,



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